EXHIBIT B

Trials@uspto.gov
571-272-7822

Paper 21
Date: May 12, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FANTASIA TRADING LLC D/B/A ANKERDIRECT,
Petitioner,

v.

COGNIPOWER, LLC,
Patent Owner.

IPR2021-00071
Patent RE47,713 E

Before KEVIN F. TURNER, JEFFREY S. SMITH, and JOHN R. KENNY, *Administrative Patent Judges*.

KENNY, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Fantasia Trading LLC D/B/A AnkerDirect ("Petitioner") filed a Petition to institute an *inter partes* review of claims 18, 19–23, 25, 30, 31, 34–36, 41–43, 45, and 48–51 (the "challenged claims") of U.S. Patent No. RE47,713 E (Ex. 1001, the "'713 patent," "challenged patent") pursuant to 35 U.S.C. § 311 *et seq*. Paper 3 ("Pet."). CogniPower LLC ("Patent Owner") filed a Preliminary Response. Paper 13 ("Prelim. Resp."). With our authorization (Paper 15), Petitioner filed a Reply to the Preliminary Response (Paper 16, "Prelim. Reply"), and Patent Owner filed a Preliminary Sur-reply to Patent Owner's Preliminary Response (Paper 18, "Prelim. Sur-reply").

We have authority to institute an *inter partes* review under 35 U.S.C. § 314 if "there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). After considering the briefing and the evidence of record, we institute an *inter partes* review in this proceeding.

A. Related Matters

The parties identify the following related district court litigation: *CogniPower LLC v. Fantasia Trading, LLC D/B/A AnkerDirect*, C.A. No. 19-cv-02293 (D. Del.). Pet. 13; Paper 5, 2.

Patent Owner identifies the following related IPRs: IPR2021-00072 and -00073, which both challenge the '713 patent, and IPR2021-00067, -00068, -00069, and -00070, which all challenge U.S. Patent No. RE47,031 E, of which the '713 patent is a continuation. Paper 5, 2–4; Ex. 1001, code (63).

B. Challenged Patent

The '713 patent relates to "switched-mode power converters" and discloses "a switched-mode power converter with regulation demand pulses sent across a galvanic isolation barrier." Ex. 1001, code (57), 1:33–35.

Figure 1 of the '713 patent is shown below:

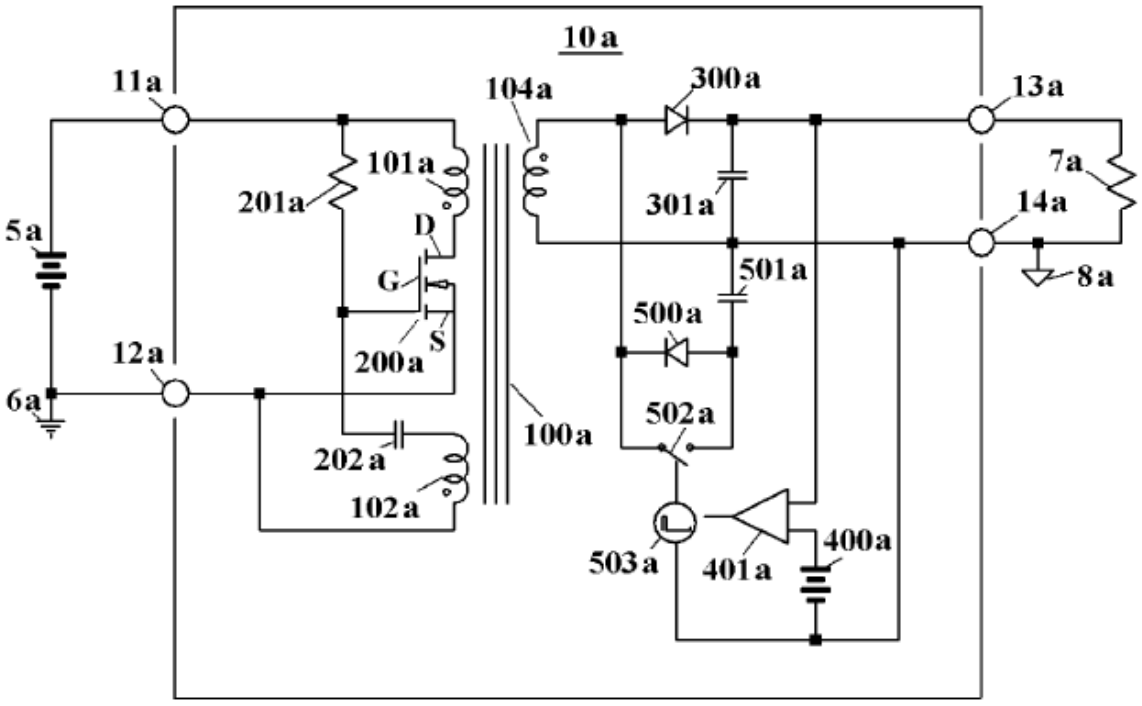


Fig. 1

Figure 1 is a schematic diagram of a power converter (10a). Ex. 1001, 2:34–35. "Terminals 11a and 12a constitute a power input port that places source 5a in circuit with primary winding 101a of transformer 100a and with communicating switch 200a." *Id.* at 2:37–41. "[S]witch 200a is a MOSFET having a source S, a gate G, and a drain D." *Id.* at 2:41–43. "Transformer 100a also comprises a regeneration winding 102a which is referenced to source S of MOSFET 200a, is connected through a capacitor 202a to gate G of MOSFET 200a, and is poled to provide regenerative feedback to gate G of

MOSFET 200a." *Id.* at 2:43–47. "MOSFET 200a, transformer 100a, capacitor 202a, and resistor 201a form an input-side blocking oscillator which acts as a driver circuit toggling ON and OFF MOSFET 200a." *Id.* at 2:50–53. "Transformer 100a also comprises a secondary winding 104a which may be connected to a floating common terminal 14a." *Id.* at 2:54–56. "[D]iode 300a and a capacitor 301a form a rectifier circuit to rectify and filter voltage pulses from winding 104a to supply power through a power output port comprising terminals 13a and 14a to an external load represented by resistor 7a connected in circuit therewith, one end of which may be referred to a floating common 8a." *Id.* at 2:56–61. "The power input port 11a/12a and the power output port 13a/14a may be galvanically isolated from each other." *Id.* at 2:61–63.

"Flyback pulses of transformer 100a occur when MOSFET 200a ceases conduction, i.e., turns OFF." Ex. 1001, 2:64–65. "Winding 104a is poled to cause diode 300a to rectify only these flyback pulses." *Id.* at 2:65–67. "Forward pulses, of opposite polarity to the flyback pulses, occur while MOSFET 200a is ON." *Id.* at 3:1–2. "Another diode 500a, poled to rectify forward pulses, and another capacitor 501a form an auxiliary rectifier circuit to rectify and filter forward pulses from winding 104a, and to store energy for triggering the input-side blocking oscillator formed by MOSFET 200a." *Id.* at 3:2–6.

"This magnetically-coupled blocking oscillator may be triggered through any transformer winding magnetically coupled thereto." Ex. 1001, 3:15–17. "Therefore, just as MOSFET 200a may be turned ON through winding 102a, it may as easily be triggered through winding 104a." *Id.* at 3:17–19. "To trigger thusly, diode 500a is briefly short-circuited by a switch

502a which is driven by a demand pulse generator 503a to source a pulse of energy from capacitor 501a into transformer 100a." *Id.* at 3:19–22.

"[T]ransformer 100a is used during the conduction of MOSFET 200a as a forward converter supplying the auxiliary rectifier circuit, and during the flyback of transformer 100a as a flyback converter supplying power to the power output port." Ex. 1001, 3:54–58. "Once the flyback pulse has reset the inductance of transformer 100a, i.e., has depleted energy from its magnetic field, transformer 100a is free, until the next ON time of MOSFET 200a, to be used as a magnetically coupled isolator to convey trigger information between its windings." *Id.* at 3:61–66. "[T]he information thus conveyed is a pulse from pulse generator 503a which, responsive to the output of comparator 401a, indicates the need for another energy-bearing cycle, and moreover retriggers the blocking oscillator to provide that energy-bearing cycle." *Id.* at 3:66–4:4.

"This converter may be fitted with a reference voltage 400a and a comparison circuit 401a." Ex. 1001, 4:8–9. "When the voltage at terminal 13a falls below the comparison voltage, comparison circuit 401a causes pulse generator circuit 503a to pulse, turning ON switch 502a, triggering an energy-bearing ON cycle of the blocking oscillator, and charging capacitor 301a." *Id.* at 4:9–13. "As load 7a drains capacitor 301a, terminal 13a voltage repeatedly falls to the voltage of reference 400a, causing comparison circuit 401a to initiate energy-bearing ON cycles." *Id.* at 4:13–16.

C. Challenged Claims

Petitioner challenges claims 18, 19–23, 25, 30–31, 34–36, 41–43, 45, and 48–51, of which claims 18 and 48 are independent. Claim 18 reads:

> 18. An article of manufacture comprising a flyback converter, the flyback converter comprising:

a primary side comprising an input port;

a secondary side comprising an output port, wherein the secondary side is galvanically isolated from the primary side; and

a power transformer configured to transfer input power received at the input port to provide output power at the output port, wherein:

the primary side further comprises a primary-side switch configured to selectively enable the input power at the input port to be transferred via the power transformer to the output power at the output port;

the secondary side further comprises a demand pulse generator that (i) determines when to turn on the primary-side switch based on output voltage or output current at the output port and (ii) generates corresponding demand pulses;

the primary side comprises a primary-side magnetically coupled conductor;

the secondary side comprises a secondary-side magnetically coupled conductor configured to be magnetically coupled to the primary-side magnetically coupled conductor to convey the demand pulses from the secondary side to the primary side;

the primary-side switch is turned on in response to the demand pulses conveyed from the secondary side to the primary side, wherein the determination of when to turn off the primary-side switch is originated on the primary side and not on the secondary side;

frequency with which the primary-side switch is turned on is adjusted by the demand pulses conveyed from the secondary side to the primary side to regulate the output voltage or the output current at the output port; and

the secondary side further comprises:

a first capacitor; and

> a first rectifier poled to charge the first capacitor during forward power converter pulses of the flyback converter, wherein the demand pulses are generated using energy stored in the first capacitor.

Ex. 1001, 14:1–43.

D. Asserted Challenges to Patentability and Prior Art

Petitioner challenges the following claims based on the grounds in the table below.

Ground	Claims Challenged	35 U.S.C. §	References
1	18, 19–23, 25, 30, 31, 34–36, 41–43, 45, 48–51	103	Zhu[1] and Mao[2]
2	18, 19-23, 25, 30, 31, 35–36, 41, 42, 45, 48–51	103	Szepesi[3] and Mao
3	18, 22–23, 25, 30, 34, 41–43, 45, 48, 49, 51	103	Matsumoto[4] and Mao

Pet. 2.

Petitioner submits a declaration (Ex. 1003) from its proffered expert, Mr. Bohannon. Patent Owner submits a declaration (Ex. 2001) from its proffered expert, Mr. Sandler.

[1] US 2011/0096573 A1, published Apr. 28, 2011 (Ex. 1005).
[2] US 6,466,461 B2, issued Oct. 15, 2002 (Ex. 1006).
[3] US 5,498,995, issued Mar. 12, 1996 (Ex. 1007).
[4] US 7,773,392 B2, issued Aug. 10, 2010 (Ex. 1010).

II. LEVEL OF SKILL AND CLAIM CONSTRUCTION

A. Level of Skill in the Art

To determine the level of an ordinarily skilled artisan, various factors may be considered, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation omitted).

Mr. Bohannon testifies that an ordinarily skilled artisan would have had a "B.S. degree, or its equivalent, in electrical engineering or physics and approximately two years of practical experience working with switching regulators and analog/mixed signal circuit design, or an equivalent combination of academic study and work experience." Ex. 1003 ¶ 43. Mr. Sandler uses the same definition for his analysis. Ex. 2001 ¶ 19.

Based on the current record, we are persuaded that Messrs. Bohannon's and Sandler's description of the level of ordinary skill in the art is appropriate for the subject matter of the '713 patent, and, for this Decision, we adopt that description.

B. Claim Construction

Neither party requests that we construe any claim term. Pet. 2; Prelim. Resp. 25. Further, we determine that we do not need to expressly construe any claim term for this Decision. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

III. ANALYSIS OF ASSERTED GROUNDS

A. Ground 1: Asserted Obviousness over Zhu and Mao

Petitioner asserts that claims 18, 19–23, 25, 30-31, 34–36, 41–43, 45, and 48–51 would have been obvious over Zhu and Mao. Pet. 2.

1. Zhu

Zhu relates to "switching mode power supplies (SMPS)." Ex. 1005 ¶ 3. Figure 3 of Zhu is shown below:

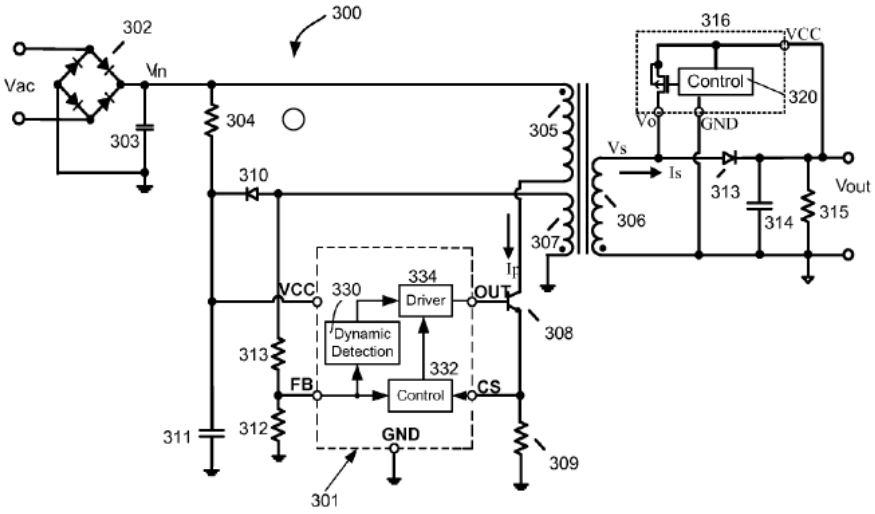


FIG. 3

Figure 3 above is "a simplified system schematic diagram of an SMPS having a rectifying diode located in the upper side of the secondary winding." *Id.* at ¶ 24. In particular, Figure 3 above "shows SMPS300 configured in a flyback converter topology." *Id.* at ¶ 41.

"System 300 includes a primary winding 305 coupled in series to a power transistor 308, a secondary winding 306, and an auxiliary winding 307." Ex. 1005 ¶ 41. "A primary side control circuit 301 receives a voltage signal through a FB input terminal and a current sense signal through a CS input terminal." *Id.* "Control circuit 301 turns on and off power transistor 308 based on the voltage and/or current signals." *Id.* "When power transistor 308 is turned on, a primary current Ip builds in primary winding 305, which stores energy." *Id.* "The energy stored in primary winding 305 is transferred to secondary winding 306 during the turn-off time interval of

power transistor 308." *Id.* "A rectifier element 313 and a smoothing capacitor 314 in secondary winding 306 converts a secondary voltage Vs into a DC system voltage Vout to supply to a load 315." *Id.* "System output voltage Vout is monitored by a secondary side controller circuit 316." *Id.* "The change information of output voltage Vout is sent by control circuit 316 in the secondary side, and received by control circuit 301 in the primary side." *Id.*

"[S]econdary side control circuit 316 includes a control circuit 320 and a switch." Ex. 1005 ¶ 42. "Control circuit 320 turns on the switch when system output voltage Vout is below a predetermined value." *Id.*

2. Mao

Mao is directed to "circuits and techniques that improve the performance of circuitry that generates a dc bias voltage for use in the primary and/or secondary stages of a power converter, such as single-ended forward-converters, single-ended flyback converters, [and an] asymmetric half-bridge converter." Ex. 1006, 1:11–15.

Figure 4A of Mao is shown below:

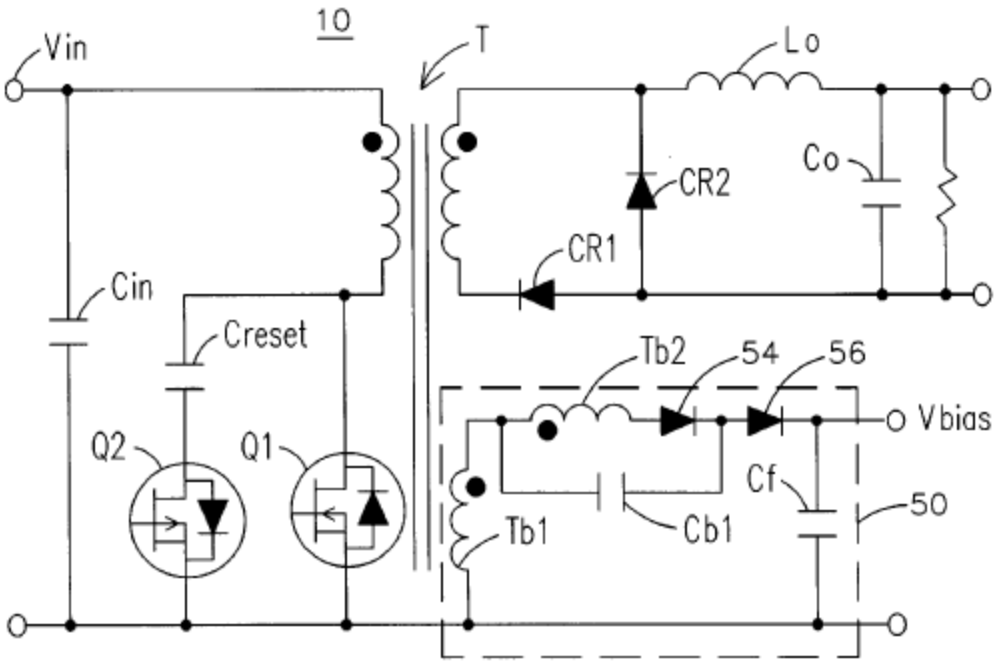


FIG. 4A

Figure 4A above illustrates "a bias circuit that . . . allows generating a bias voltage that is less sensitive to swings in the input voltage range as compared to [a prior art] biasing circuit." Ex. 1006, 2:63–67. Bias circuit 50 includes bias windings Tb1 and Tb2, which are voltage sources, and are coupled with an isolating transformer T. *Id.* at 3:12–29. Cb1 is a voltage-holding capacitor and Cf is a filter capacitor that is coupled in parallel with the load to which bias circuit 50 delivers energy. *Id.*

Figure 9 of Mao is shown below:

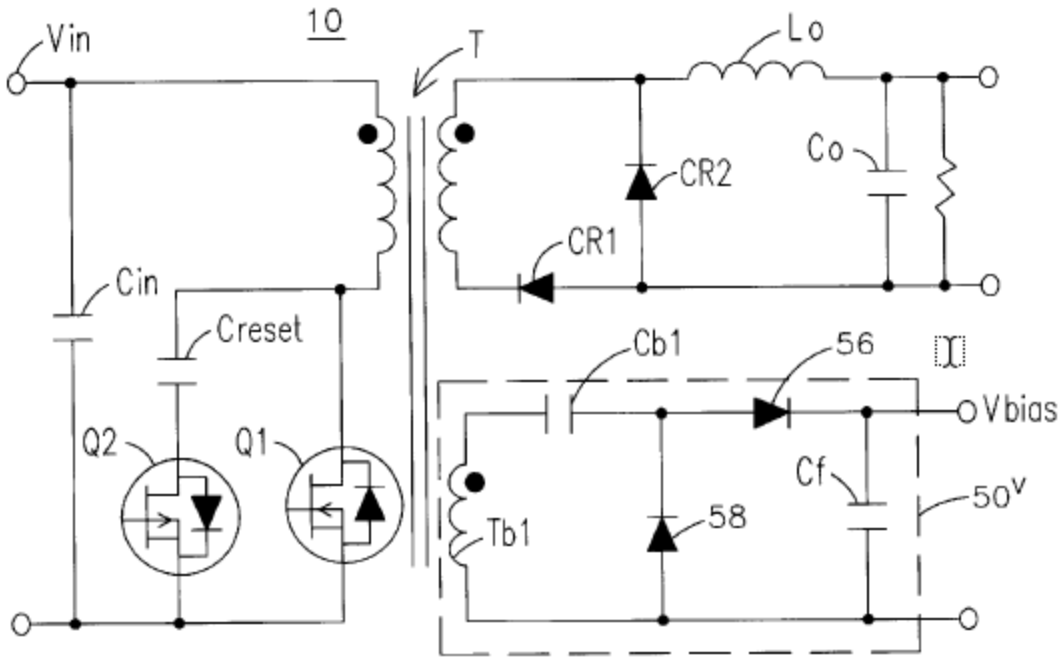


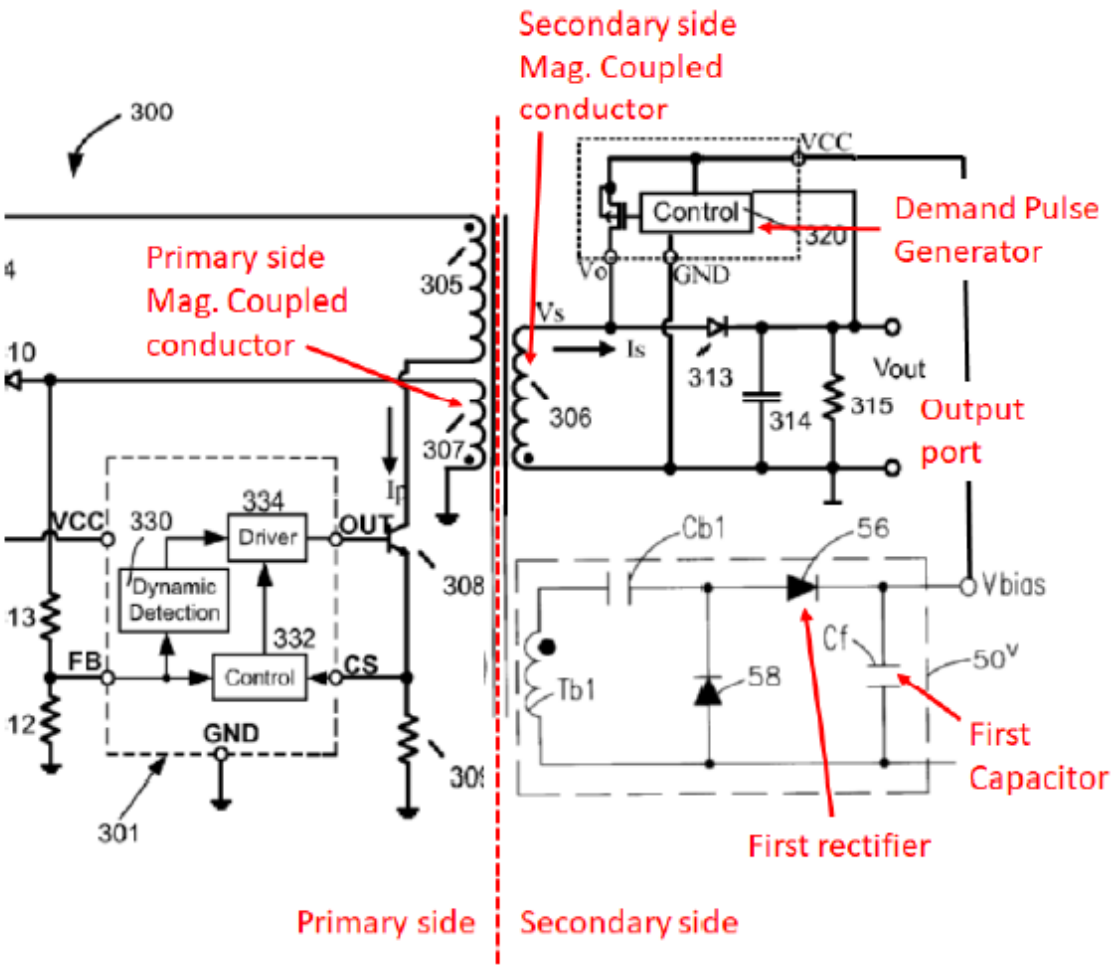
FIG. 9

Figure 9 above shows power converter 10 with circuit 50^V, diodes 56 and 58, capacitors Cb1 and Cf, and bias winding Tb1. Mao has no express, textual description of this figure.

3. Proposed Combination of Zhu and Mao

Petitioner argues that "[i]t would have been within the skill of [an ordinarily skilled artisan] to modify Zhu to add the improved bias circuit of Mao, either by providing an additional bias winding or by including the Mao circuit in the output stage itself." Pet. 14 (citing Ex. 1003 ¶¶ 59–60). Mr. Bonham provides the following annotated figure displaying this combined

structure ("Zhu-Mao Combination Figure," "Zhu-Mao Combined SMPS," respectively):



Ex. 1003 ¶ 59. The above Zhu-Mao Combined SPMS combines the SMPS of Figure 3 of Zhu with bias circuit 50^{V} of Figure 9 of Mao. Ex. 1005, Fig. 3; Ex. 1006, Fig. 9. Mr. Bohannon testifies that in the above figure "the bias circuitry of FIG. 9 of Mao has been attached in place of the bias circuitry in Zhu, which merely powered the secondary controller using the output voltage." Ex. 1003 ¶ 60. The Zhu-Mao Combination Figure also includes annotations by Mr. Bonham, identifying his mapping of various elements in the challenged claims to the structures shown in the figure. *Id.* ¶ 59.

4. Preamble and Limitations of Claim 18

a. 18.0.[5] preamble

Claim 18's preamble recites "[a]n article of manufacture comprising a flyback converter, the flyback converter comprising." Petitioner cites Zhu and Mao for this recitation. Petitioner argues that Zhu discloses a flyback converter, quoting Zhu's disclosure that "FIG.3 shows SMPS300 configured in a flyback converter topology." Pet. 14 (quoting Ex. 1005 ¶ 41). Petitioner further argues that "Mao discloses a power converter and a bias circuit for providing power to a secondary control circuit, including in flyback converters." *Id.* Petitioner cites Mao's disclosure that Mao is "generally related to control and operation of power converter devices, and, more particularly, to circuits and techniques that improve the performance of circuitry that generates a dc bias voltage for use in the primary and/or secondary stages of a power converter, such as . . . single-ended flyback converters." Ex. 1006, 1:9–16 (cited by Pet. 14). Patent Owner presents no counterargument concerning the preamble of claim 18.

We determine that Petitioner has made a sufficient showing for the preamble of claim 18.[6]

[5] For ease of reference, we use Petitioner's numerical identifiers for the preamble and claim limitations.

[6] For this reason, we do not need to determine whether the preamble of claim 18 is limiting.

b. 18.1. a primary side comprising an input port

Petitioner argues that Zhu discloses a primary side with an input port. Pet. 14. Petitioner provides an annotated version of Figure 3 of Zhu ("Petitioner's Annotated Zhu Figure 3") shown below:

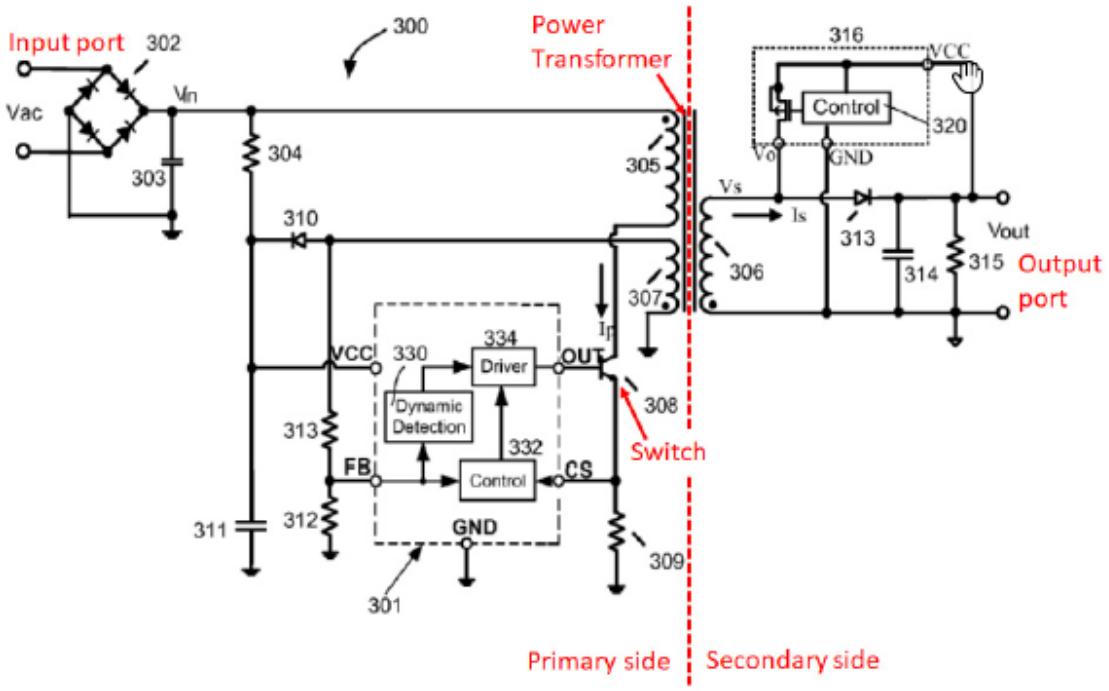


FIG. 3

Id. at 15. In Petitioner's Annotated Zhu Figure 3 above, Petitioner indicates that windings 305 and 307 and everything to the left of those windings constitute the primary side of the switching mode power supply. In this annotated figure, Petitioner further indicates that Vac, which is shown to the left of windings 305 and 307, is the input port. Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

c. 18.2. a secondary side comprising an output port, wherein the secondary side is galvanically isolated from the primary side

Petitioner argues that Zhu disclose a transformer that provides galvanic isolation of a secondary side and output port. Pet. 15. In Petitioner's Annotated Zhu Figure 3 (shown in Section III.A.4.b. above), Petitioner identifies winding 306 and everything to the right of that winding as the secondary side of the SMPS. *Id.* In this figure, Vout is to the right of winding 306. *Id.* Petitioner indicates that Vout is the output port. *Id.* Further, Petitioner indicates that the secondary side is galvanically isolated from the primary side by windings 305, 306, and 307. *Id.* Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

d. 18.3. a power transformer configured to transfer input power received at the input port to provide output power at the output port

Petitioner argues that Zhu discloses the recited power transformer. Pet. 15. In Petitioner's Annotated Zhu Figure 3 (shown in Section III.A.4.b. above), Petitioner maps the recited power transformer to windings 305, 306, and 307. Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

e. 18.4. the primary side further comprises a primary-side switch configured to selectively enable the input power at the input port to be transferred via the power transformer to the output power at the output port

Petitioner argues that Zhu discloses this limitation. Pet. 15–16. In Petitioner's Annotated Zhu Figure 3 (shown in Section III.A.4.b. above), Petitioner maps the recited switch to power transistor 308. Further, Petitioner quotes Zhu's disclosure that "[s]ystem 300 includes a primary winding 305

coupled in series to a power transistor 308." *Id.* at 16 (quoting Ex. 1005 ¶ 41). Further, in Petitioner's Annotated Zhu Figure 3 (and in Zhu Figure 3), power transistor 308 is to the left of winding 305. Pet. 17. Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

f. 18.5. the secondary side further comprises a demand pulse generator that (i) determines when to turn on the primary-side switch based on output voltage or output current at the output port and (ii) generates corresponding demand pulses

Petitioner argues that Zhu's controller 316 is the recited demand pulse generator. Pet. 16. Petitioner cites to Zhu's description of "an exemplary circuit diagram of secondary side controller circuit 316." Ex. 1005 ¶ 45 (cited by Pet. 16.). In that description, second side controller 316 uses comparator 503 to compare an attenuated voltage (510) (derived from an output voltage (Vout)) with a reference voltage Vref to sense a change at Vout. *Id.* If attenuated voltage 510 is below Vref, then pulse generator 504 will generate a series of pulses 505, which will ultimately cause a current flow in secondary winding 306. *Id.* Petitioner cites to Zhu's disclosure that the current in secondary winding 306 causes a primary side controller to turn on a primary-side switch. Pet. 16 (citing Ex. 1005 ¶ 7). Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

g. 18.6. the primary side comprises a primary-side magnetically coupled conductor

Petitioner argues that auxiliary winding 307 in Zhu is the recited primary-side magnetically coupled conductor. Pet. 17. Petitioner quotes Zhu's disclosure that: "[s]ystem 300 includes a primary winding 305 coupled

in series to a power transistor 308, a secondary winding 306, and an auxiliary winding 307." *Id.* (quoting Ex. 1005 ¶ 41). Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

> *h. 18.7. the secondary side comprises a secondary-side magnetically coupled conductor configured to be magnetically coupled to the primary-side magnetically coupled conductor to convey the demand pulses from the secondary side to the primary side*

Petitioner argues that the transformer secondary winding in Zhu is the recited second side magnetically coupled conductor. Pet. 17–18. In Petitioner's Annotated Zhu Figure 3 (shown in Section III.A.4.b. above), Petitioner identifies secondary winding 306 as the secondary side magnetically coupled conductor. *Id.* at 17. Petitioner quotes the following disclosure in Zhu:

> when the system output voltage is lower than a predetermined value, *electrical signals are applied to a secondary winding of the transformer. These electrical signals are communicated to a primary side controller through an auxiliary winding.* The primary side controller *senses the electrical signals and turns on a power switch* coupled in series with a primary winding for a time period.

Id. at 17–18 (quoting Ex. 1005 ¶ 7) (emphasis by Petitioner). Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

> *i. 18.8. the primary-side switch is turned on in response to the demand pulses conveyed from the secondary side to the primary side, wherein the determination of when to*

turn off the primary-side switch is originated on the primary side and not on the secondary side

Petitioner argues that Zhu's primary side switch is turned on in response to demand pulses conveyed from the secondary side to the primary side. Pet. 18. Petitioner relies on its argument for limitation 18.5. *Id.* Further, Petitioner argues that the primary side switch in Zhu is turned off by Zhu's primary-side controller. *Id.* (citing Ex. 1005 ¶¶ 35–36). Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

j. 18.9. frequency with which the primary-side switch is turned on is adjusted by the demand pulses conveyed from the secondary side to the primary side to regulate the output voltage or the output current at the output port

Petitioner argues that Zhu discloses that its embodiments can be used with variable frequency. Pet. 18. Petitioner quotes Zhu's disclosure that "the invention has been applied to control the output voltage undershoot of . . . a pulse frequency modulated (PFM) switching mode power." *Id.* (quoting Ex. 1005 ¶ 3). Petitioner also argues that paragraphs 50 and 51 of Zhu describe exemplary system waveforms of Figure 8 and show frequency adjustment. *Id.* at 18–19. Patent Owner provides no counterargument. We determine that Petitioner has made a sufficient showing for this limitation.

k. 18.10. the secondary side further comprises: a first capacitor

Petitioner argues that Zhu's secondary control is powered from Vout stored on the output capacitor 314 shown in Figure 3. Pet. 19. Petitioner further argues that Mao teaches a bias winding with a capacitor Cf and a rectifier (diode 56) on the secondary side. *Id.* Petitioner argues that, when

the teachings of the references are combined, diode 56 is the recited first rectifier and capacitor Cf is the recited first capacitor. *Id.* Patent Owner provides no direct counterargument.[7] We determine that Petitioner has made a sufficient showing for this limitation.

> *l. 18.11. [the secondary side further comprises] a first rectifier poled to charge the first capacitor during forward power converter pulses of the flyback converter, wherein the demand pulses are generated using energy stored in the first capacitor*

Petitioner argues that, in the Zhu-Mao Combined SMPS, diode 56 is the first rectifier and Cf is the first capacitor. Pet. 19. Mr. Bohannon testifies that Mao teaches poling a diode to charge a bias capacitor during forward operation of a power converter. Ex. 1003 ¶ 97. Mr. Bohannon quotes the following passage from Mao:

> During this mode of operation, i.e., when power switch Q1 is ON to induce a forward voltage, diode 56 would be in a conductive state and diode 54 would be in a non-conductive State. If the capacitance of intermediate voltage-holding capacitor Cb1 is sufficient, its voltage will be held essentially unchanged during this period. The combined voltage of the two voltage sources, exclusive of any voltage drop across any of diodes 52 and 54, comprises the bias voltage, Vbias, to which, in operation, filter capacitor Cf is charged to and holds while delivering energy to the load connected to the bias circuit.

Id. (quoting Ex. 1006, 3:59–4:2).

[7] Based on Patent Owner's counterarguments regarding limitation 18.11, it would appear that Patent Owner does not believe that capacitor Cf is on the secondary side of the Zhu-Mao Combination SMPS. Prelim. Resp. 35. As set forth in Section III.A.4.l., however, for purposes of this Decision, we are not persuaded by those counterarguments.

Mr. Bohannon further testifies that, when the teachings of Mao are combined with Zhu, Zhu's control 320 (the demand pulse generator) would be powered by the energy stored on the capacitor (50v) of Mao's bias circuit. Ex. 1003 ¶ 99. Mr. Bohannon testifies that an example of how capacitor 50v could power Zhu's control 320 is shown in the Zhu Mao Combination Figure. *Id.* In that figure (shown in Section A.3. above), Vbias in Mao Figure 9 is connected via wire to Vcc in Zhao Figure 3. *Id.* ¶ 59.

Patent Owner disputes that the combination of Zhu and Mao teach this limitation. Prelim. Resp. 26–36. Patent Owner argues that Petitioner combines the bias circuit of Figure 9 of Mao with Zhu, but Patent Owner argues that Mao does not describe how its Figure 9 operates. *Id.* at 27–29. According to Patent Owner, Petitioner relies on Mao's descriptions of bias circuits shown in other figures, but Petitioner never explains why the bias circuit of Figure 9 would operate analogously. *Id.* Patent Owner further argues that the bias circuit of Figure 9 is materially different from the bias circuits described in Figure 4A, 5A, 6A, 7A, and 8A, which are all grounded to the primary side of power converter 10, whereas the bias circuit of Figure 9 is not. *Id.* at 28. Patent Owner also argues that, in a related proceeding, IPR2021-00067, Petitioner suggested that Mao's description of its Figure 4C was actually a description of Figure 9. *Id.* at 28–29.

Patent Owner further argues that the bias circuit shown in Figure 9 of Mao is not a secondary side circuit. Prelim. Resp. 29–35. Patent Owner notes that the above limitation requires that the first rectifier be on the secondary side of the flyback converter. *Id.* at 29. (As discussed for limitation 18.10, Petitioner maps the first rectifier to diode 56 in Mao's bias circuit 50^{V} of its Figure 9. Pet. 19.) Patent Owner argues that Mao's bias

circuit 50^V in its Figure 9 is not part of the secondary side of Mao's flyback converter. Prelim. Resp. 33–34. Patent Owner argues that Figure 4A of Mao makes clear that its bias circuit is not part of the secondary side of its flyback converter because its bias circuit is not galvanically isolated from the primary side: it shares the same ground as the primary side. *Id.* at 31–33. Patent Owner provides the following annotated version of Figure 4A ("Patent Owner's Annotated Mao Figure 4A"):

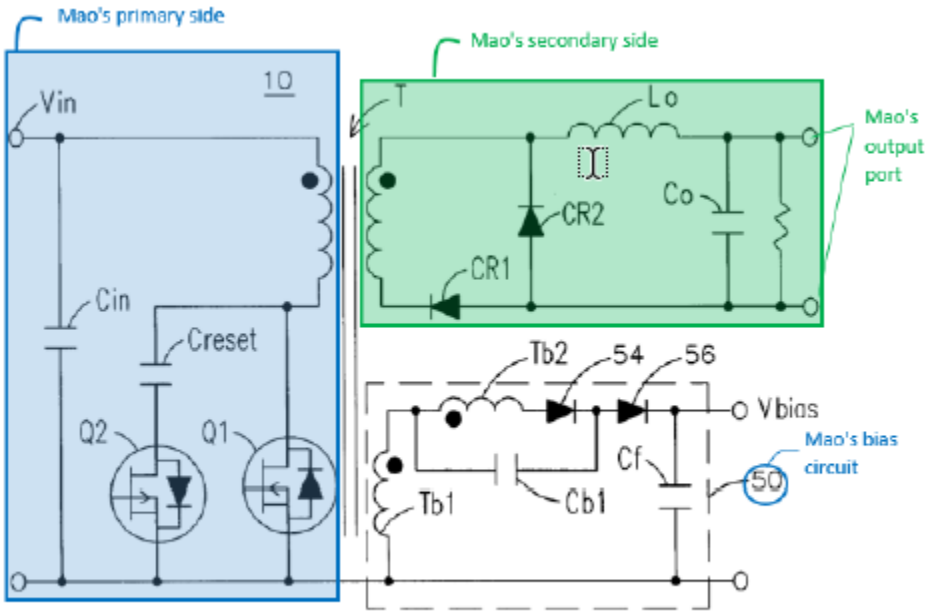
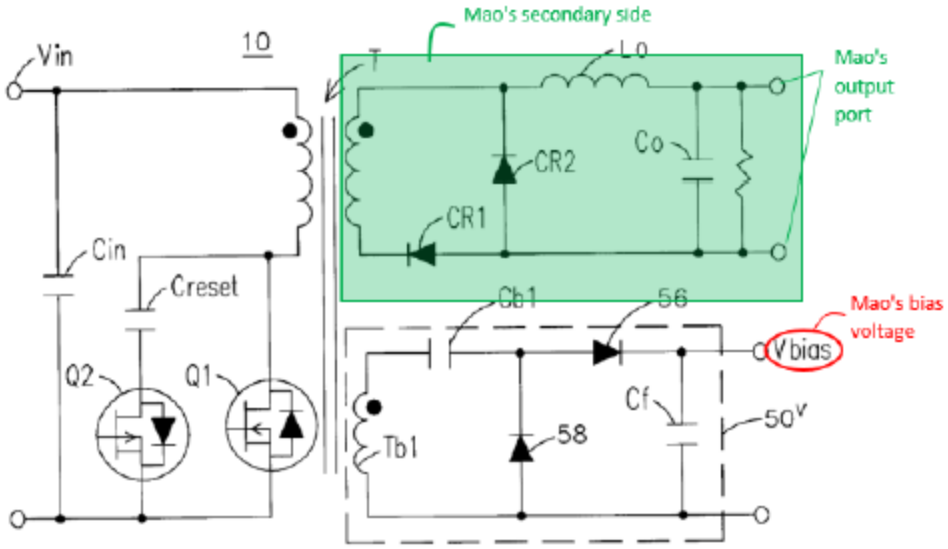


FIG. 4A

Prelim. Resp. 31. In Patent Owner's Annotated Mao Figure 4A above, Patent Owner indicates the parts of converter 10 that are shown on the left side of transformer T constitutes Mao's primary side. *Id.* In this figure, Patent Owner further indicates that the portions of converter 10 that are (i) on the right side of transformer T and (ii) above bias circuit 50 constitute Mao's secondary side. *Id.* In this figure, bias circuit 50 is indicated as not being part of either Mao's first or secondary sides. *Id.* Patent Owner further argues that the bias circuits in Figures 1, 5A, 6A, 7A, and 8A are also connected to

the grounds of the primary side of their converters, so they are also not part of the secondary side of those converters. *Id.*

Patent Owner further argues that the secondary side in the converter of Figure 9 of Mao would not encompass its bias circuit. Prelim. Resp. 33–35. Patent Owner provides the following annotated version of Figure 9 ("Patent Owner's Annotated Mao Figure 9"):



Prelim. Resp. 34. In Patent Owner's Annotated Mao Figure 9 above, Patent Owner indicates that only the portions of converter 10 that are (i) on the right side of transformer T and (ii) above the bias circuit 50 constitute Mao's secondary side. *Id.* Patent Owner argues that the output of the transformer is part of the secondary side. *Id.* Patent Owner further argues that Figure 9 of Mao shows no connection between Vbias and the portions of the circuit Patent Owner has identified as Mao's secondary side, which includes the output ports. *Id.* Further, Patent Owner argues that the bias circuit 50V is in a voltage domain that is independent of both the primary and secondary voltage domains. *Id.* at 35.

There are two disputed issues: (i) whether the lack of textual description for Mao Figure 9 renders Petitioner's showing insufficient and (ii) whether bias circuit 50^V in the Zhu-Mao Combined SMPS is on the secondary side of that SMPS. At trial, the parties and their experts should address these issues further. On this preliminary record, however, we find Petitioner's showing sufficient.

Patent Owner correctly notes that Mao provides no textual description for Mao Figure 9 and that the Petition does not address this issue. Pet. 11–20; Prelim. Resp. 26–29; Ex. 1006. Figure 9 of Mao, however, sets forth circuitry that both an expert and an ordinarily skilled artisan would appear to be able to interpret without accompanying text. Ex. 1006, Fig. 9. In particular, Figure 9 appears to use standard symbols for capacitors, diodes, inductors, windings, and Mao uses the same symbols in other figures that have accompanying text that identify what those symbols mean. *Id.* at Figs 4A, 5A, 6A, 7A, 8B, 9. Thus, on this preliminary record, we do not find that the lack of textual description in Mao of its Figure 9 renders Petitioner's showing insufficient for purposes of institution. It would be useful, however, for the parties and their experts, to address further that lack of textual description during trial.

On the current record, only the Patent Owner has expressly addressed why bias circuit 50^V is or is not on the secondary side of the SMPS for the Zhu-Mao Combined SMPS. Pet. 19–20; Prelim. Resp. 29–35. Petitioner identifies bias circuit 50 as being on the secondary side of the Zhu-Mao Combined SMPS, and Mr. Bohannon testifies that it is on that secondary side, but neither Petitioner nor Mr. Bohannon have expressly addressed why it is on that secondary side. Pet. 19–20; Ex. 1003 ¶¶ 86–102.

On this preliminary record, we are not persuaded by Patent Owner's arguments regarding the location of bias circuit 50^V. Patent Owner argues that, in Figure 4A of Mao, bias circuit 50's ground is connected to the ground of primary side of the flyback converter. Prelim. Resp. 31–32. Patent Owner asserts that, as a result, bias circuit 50 is not galvanically isolated from the primary side and thus is not secondary-side circuitry. *Id.* at 33. We are not persuaded by this argument for two reasons. First, Patent Owner has cited no objective evidence that circuitry must be galvanically isolated from the primary side of a converter to be secondary-side circuitry. *Id.* at 31–33. Claim 18 recites the limitation that the "secondary side is galvanically isolated from the primary side." Ex. 1001, 14:4–6. That claim language at least suggests that a secondary side is not inherently galvanically isolated from its primary side because, if it were, the limitation would be meaningless. Second, bias circuit 50^V in Mao Figure 9 is shown as not connected to the ground of the primary side of its converter. Ex. 1006, Fig. 9. Thus, even under Patent Owner's theory that only a circuit that is galvanically isolated from the primary side of a converter can be on the converter's secondary side, bias circuit 50^V could be part of the converter's secondary side.

On this preliminary record, we determine that bias circuit 50^V is on the secondary side of the converter in the Combined Zhu-Mao SMPS. In that SMPS, bias circuit 50 is electrically connected to the circuitry that contains winding 306, circuitry that neither party disputes is part of Zhu's secondary side. Pet. 17. In particular, in that SMPS, Vbias is directly connected to Vcc. *Id.* Thus, for this Decision, we determine that bias circuit 50^V is secondary side circuitry in the Combined Zhu-Mao SMPS. It would be useful,

however, for the parties and their experts to further address this issue during trial.

We determine that Petitioner has made a sufficient showing for this limitation.

5. Motivation to Combine and Reasonable Expectation of Success

Petitioner argues that an ordinarily skilled artisan would have made the Zhu–Mao Combined SMPS for four reasons: (i) to avoid undesirable voltage fluctuations in the power to Zhu's secondary controller ("voltage-fluctuation rationale"), (ii) to enable Zhu to be more easily applied to power supplies operating at low output voltages ("low-output-voltage rationale"), (iii) to enable Zhu to be more easily applied to power supplies operating in a constant current mode ("constant-current-mode rationale"), and (iv) to allow Zhu to be more easily applied to additional power supply topologies ("additional-topologies rationale"). Pet. 13–14. In this section, we first address Petitioner's low-output-voltage rationale; then, we address Petitioner's other rationales. Finally, we address the parties' arguments regarding whether an ordinarily skilled artisan would have had a reasonable expectation of success in making the proposed combination.

a. Low Output Voltages

Petitioner argues that an ordinarily skilled artisan would have "understood that the Zhu bias circuit would be unable to accommodate very low output voltages." Pet. 13 (citing Ex. 1003 ¶ 58, Ex. 1008, 3). Citing the TSM101 Application Note (Ex. 1008), Petitioner argues that the inability of a circuit, like Zhu's, to accommodate very low output voltages was well understood in the art. *Id.* Petitioner asserts that, as a result, an ordinarily skilled artisan "would have been motivated to improve the Zhu bias circuit

using the teachings of Mao to . . . improve the operation of the specific Zhu circuit." *Id.*

Patent Owner argues that, in presenting this rationale, Petitioner focuses on what an ordinarily skilled artisan could have done, rather than would have done. Prelim. Resp. 36–37. Patent Owner further argues that Petitioner has not shown that Zhu could not accommodate low voltages without modification. *Id.* at 52. In addition, Patent Owner asserts that the TSM101 Application Note describes the operation of a particular integrated circuit, TSM101, with classical SMPS and that Petitioner has not shown that the limitations of the TSM101 controller used with classical SMPS apply to Zhu. *Id.* Further, Patent Owner argues that an ordinarily skilled artisan could make other modifications to accommodate low voltages and that the TSM101 controller would not function with Zhu. *Id.* at 53. Patent Owner also argues that Zhu does not have a bias circuit. *Id.* at 52.

We determine that, for this rationale, Petitioner has presented evidence of what an ordinarily skilled artisan would have done, rather than merely could have done. The rationale of accommodating low output voltages concerns what an ordinarily skilled artisan would have been motivated to do, not merely what that artisan could do.

We also determine that, for purposes of institution, Petitioner has set forth a sufficient showing that an ordinarily skilled artisan would have combined the teachings of Zhu and Mao to accommodate very low output voltages.[8] As indicated, Petitioner contends that a person of ordinary skill in the art would have understood that the power converter of Zhu would be

[8] At trial, the parties may want to address what the referenced very low output voltages or low output voltages are.

unable to accommodate very low output voltages when the output voltage drops to a level that was insufficient to reliably power the secondary control circuit. Pet. 13 (citing Ex. 1008, 3; Ex. 1003 ¶ 58). As further indicated, Petitioner contends that an ordinarily skilled artisan would have been motivated to improve the operation of Zhu by including the bias circuit of Mao in the output stage of Zhu for the benefit of operating Zhu's secondary circuit at lower output voltages as taught by TSM101. Pet. 13–14 (citing Ex. 1008; Ex. 1003 ¶¶ 59–60).

This rationale is supported by the testimony of Mr. Bohannon, who testifies that an ordinarily skilled artisan would have recognized that the circuit shown in Figure 3 of Zhu could not accommodate low output voltages and that an ordinarily skilled artisan would have been motivated to overcome this problem by providing an additional bias winding to Zhu or including the bias circuit of Mao Figure 9 (which has an auxiliary secondary winding Tb1) in the output stage to Zhu. Ex. 1003 ¶¶ 59–60; *see id.* ¶ 57 (TSM101 "points out the forward-bias circuit as having advantages over using the output voltage itself to power the secondary controller.").

Mr. Sandler does provide contrary testimony. Mr. Sandler testifies that the TSM101 Application Note describes how the TSM101 controller functions when used in a SMPS with a linear optocoupler for feedback. Ex. 2001 ¶ 56. Mr. Sandler further testifies that Zhu does not use a TSM101 controller. *Id.* ¶ 57. Further, Mr. Sandler testifies that more efficient alternatives could be pursued to accommodate low voltages. *Id.* Mr. Sandler also testifies that Zhu does not use a linear optocoupler for feedback. *Id.* ¶ 58. According to Mr. Sandler, therefore, the TSM101 controller would not

be used with Zhu and the limitations applicable to that controller are not applicable to Zhu. *Id.* ¶¶ 64, 65.

Zhu and the TSM101 Application Note support Mr. Bohannon's testimony. Zhu is directed to "switching mode power supplies (SMPS)." Ex. 1005 ¶ 3. The TSM101 Application Note is also directed to SMPS. Ex. 1008, 1. In Figure 3 of Zhu, control 320 is supplied with the output voltage of the SMPS. In Figure 3 of the TSM101 Application Note, integrated circuit TSM101 also is powered by the output voltage of its SMPS. *Id.* at 3 (ground of the SMPS is connected to pin 4 (GND) of the TSM101 voltage controller, the non-grounded output signal of the circuit is connected to pin 8 (VCC) of the TSM 101 voltage controller). The Application Note teaches, however, that a problem with the SMPS of its Figure 3 is that "[i]n applications requiring low voltage battery charge . . . the output voltage can be too low to supply correctly the TSM101." *Id.* at 3. The Application Note further discloses that "a solution to provide a quasi constant supply voltage to the TSM101" is to add an auxiliary winding to the secondary side of the transformer. *Id.* The bias circuit of Figure 9 of Mao has an auxiliary winding Tb1 on the secondary side of Mao's transformer. Ex. 1006, Fig. 9. Thus, these teachings support Mr. Bohannon's testimony that an ordinarily skilled artisan would been motivated to add the bias circuit of Mao to the SMPS of Figure 3 of Zhu.

Regarding Mr. Sandler's testimony that Zhu could not be used with the TSM101 controller, the mere fact that the TSM101 controller may not be physically combinable with Zhu's SMPS does not undermine a showing of obviousness. *Facebook, Inc. v. Windy City Innovations*, 973 F.3d 1321, 1343 (Fed. Cir. 2020). Further, Petitioner does not propose incorporating the

optocoupler feedback mechanism of TSM101 into the structure of Zhu. Rather, Petitioner's combination incorporates the bias circuit of Mao into the power converter of Zhu, and relies on the teachings of TSM101 to provide a reason for doing so.

Given the similarities between the circuits shown in Figure 3 of the TSM101 Application Note and Zhu Figure 3, on this preliminary record, we find that the TSM101 Application Note supports Mr. Bohannon's testimony and Petitioner's rationale for combining Zhu and Mao. The applicability of the teachings of the TSM101 Application Note to the combination of Zhu and Mao, and the efficiency of Petitioner's proposed modification, however, should be explored further during trial.

Regarding Zhu's purported bias circuit, Petitioner has not identified such a circuit in Zhu. Pet. 10–17. This leaves Petitioner's statements about Zhu's bias circuit unsupported. *Id.* at 13. For purposes of this Decision, however, we do not find Petitioner's lack of support for a bias circuit in Zhu to be fatal for its showing. Petitioner provides a showing of how Zhu and Mao can be combined that is not dependent on Zhu having a bias circuit. *Id.* at 17 (showing the Zhu-Mao Combination Figure, in which the secondary circuit of Zhu is powered by the bias voltage of Mao instead of the output voltage of Zhu). The parties, however, should explore this issue further during trial, and, during the trial, Petitioner should identify the circuit in Zhu that it contends is a bias circuit.

In sum, we determine that Petitioner presented sufficient evidence for its low-output-voltage rationale to combine the teachings of Zhu and Mao.

b. Petitioner's Other Rationales

In this section, we address Petitioner's three additional rationales for combining Zhu and Mao's teachings: (i) the voltage-fluctuation rationale, (b) the constant-current-mode rationale, and (c) the additional-topologies rationale. Pet. 13–14. Although, for this Decision, we do not need to determine the sufficiency of these rationales in light of our determination regarding Petitioner's low-output-voltage rationale, we nevertheless briefly address these additional rationales here.

i. Voltage Fluctuations

Petitioner argues that Mao expressly teaches that a bias circuit, such as shown in Zhu, used to power its secondary controller can be vulnerable to undesirable fluctuations. Pet. 13 (citing Ex. 1006, 1:50–55). Petitioner argues that this vulnerability would have motivated an ordinarily skilled artisan to make the Zhu-Mao Combined SMPS. *Id.* at 14.

Patent Owner argues that Zhu does not have a bias circuit. Prelim. Resp. 46–51. Further, Patent Owner asserts that Petitioner has not shown that the undesirable voltage fluctuations that Mao is concerned with would be present in Zhu. *Id.* at 38. Patent Owner asserts that Mao is directed towards stabilizing an unregulated bias, whereas the control circuit in Zhu is powered by a regulated voltage. *Id.* at 42. Patent Owner argues that, as such, there is no need to add Mao's bias circuit to Zhu to avoid undesirable voltage fluctuations in Zhu. *Id.* at 45.

As mentioned, in light of our determination regarding Petitioner's low-output-voltage rationale, for this Decision, we do not need to determine whether Petitioner has sufficiently supported its voltage-fluctuation rationale. Additional briefing on the disputed issues concerning this rationale, however,

could be beneficial (e.g., are voltage fluctuations an issue with Zhu's regulated voltage?[9]).

ii. Constant Current Mode

Petitioner argues the Zhu bias circuit, if used in a constant current mode, would cause the output voltage to drop to a level that was insufficient to reliably power Zhu's secondary circuits. Pet. 13. Citing the TSM101 Application Note, Petitioner asserts that this issue was well known. *Id.* (citing Ex. 1008, 3). Therefore, Petitioner argues that an ordinarily skilled artisan would have been motivated to combine Mao's teachings with Zhu to allow Zhu to be used in power supplies with a constant output current mode. *Id.*

Patent Owner argues that Zhu was designed to operate in a constant voltage mode, not a constant current mode. Prelim. Resp. 56. Patent Owner further argues that Petitioner has not shown that the concerns expressed in the TSM101 Application Note are applicable to Zhu's circuit. *Id.* at 55–57.

As mentioned, in light of our determination regarding Petitioner's low-output-voltage rationale, for this Decision, we do not need to determine whether Petitioner has sufficiently supported its constant-current-mode rationale. Additional briefing on the disputed issues regarding this rationale could be beneficial (e.g., would Zhu's circuit be used in a constant current mode?).

[9] The questions posed in this Decision do not constitute implicit rulings on the timeliness of any argument or evidence presented at trial.

iii. Additional Topologies

Petitioner argues that an ordinarily skilled artisan would have been motivated to combine Mao's teachings with Zhu to allow Zhu to be more easily applied to additional power supply topologies. Pet. 13. Patent Owner argues that, to the extent this argument by Petitioner refers to anything other than accommodating low voltages or operating in a constant current mode, Petitioner has not provided any support for this rationale. Prelim. Resp. 58–59.

As mentioned, in light of our determination regarding Petitioner's low-output-voltage rationale, for this Decision, we do not need to determine whether Petitioner has sufficiently supported its additional-topologies rationale. Additional briefing on the disputed issues concerning this rationale, however, could be beneficial (e.g., what are the referenced additional topologies?).

c. Reasonable Expectation of Success

Petitioner argues that "[i]t would have been within the skill of a POSITA to modify Zhu to add the improved bias circuit of Mao, either by providing an additional bias winding or by including the Mao circuit in the output stage itself." Pet. 14. As mentioned, Petitioner provides the Zhu-Mao Combination Figure (shown in Section III.A.3. above) as an example of how an ordinarily skilled artisan would add Mao's bias circuit to Zhu's SMPS. Pet. 17.

Patent Owner disagrees, arguing that Petitioner's Zhu–Mao Combination Figure has a floating terminal that would render the combined circuit inoperable. Prelim. Resp. 60. Patent Owner also argues that

Petitioner does not explain what it means to provide an additional bias winding or where such a winding would be situated. *Id.* at 37.

On the current record, we determine that Petitioner has demonstrated a reasonable expectation of success for its proposed combination. The terminal that Patent Owner indicates is floating is shown as an output that is directly under Vbias in the Zhu-Mao Combination Figure. Prelim. Resp. 60. In this combined figure, Vbias is being used to power the control 320, which is connected to ground. *Id.* For that reason, it would appear that an ordinarily skilled artisan would have recognized that the terminal identified as floating should be connected to ground. An ordinarily skilled artisan may have also have believed that it was a mistake not to identify the terminal as grounded. This issue, however, should be explored further during trial.[10]

Further, Petitioner does not appear to explain what it means by adding an additional bias winding to Zhu or where that winding in Zhu should be placed. Pet. 14. Thus, Petitioner's arguments regarding adding an additional bias winding to Zhu appear undeveloped. *Id.* For purposes of this Decision, this is not fatal to Petitioner's showing, however, because Petitioner provides an alternative combination of Zhu and Mao's teaching—the Zhu-Mao Combined SMPS addressed above, for which Petitioner identifies how the references' teachings would be combined. Pet. 13–14, 17.

For purposes of this Decision, we determine that Petitioner has made a sufficient showing regarding a motivation to combine and a reasonable expectation of success.

[10] The parties may also want to address what the line connecting Vout to control 320 in the Zhu Mao Combined Figure represents. Pet. 17.

6. Summary for Claim 18

Petitioner has demonstrated a reasonable likelihood of establishing that Zhu and Mao would have rendered claim 18 obvious.

7. Claim 48

Claims 18 and 48 differ in their preambles. Claim 18 recites "[a]n article of manufacture comprising a flyback converter, the flyback converter comprising . . . ."; whereas claim 48 recites "[a] flyback converter comprising . . . ." Ex. 1001, 14:1–43, 17:14–55. The bodies of claims 18 and 48 are the same. *Id.*

For claim 48, Petitioner relies on its showing for claim 18, and Patent Owner presents the same arguments as for claim 18. Pet. 9–27; Prelim. Resp. 25–65. We determine that Petitioner has demonstrated a reasonable likelihood of establishing that Zhu and Mao would have rendered claim 48 obvious.

8. Claims 19–23, 25, 30–31, 34–36, 41–43, 45, and 49–51

Petitioner sets forth how it contends the combination of Zhu and Mao teach or suggest the limitations of claims 19–23, 25, 30–31, 34–36, 41–43, 45, and 49–51. Pet. 20–27. Each of these claims depends directly or indirectly from claim 18. Ex. 1001, 14:44–18:6. Patent Owner argues that Petitioner's showing is inadequate for these claims for the same reasons as for claim 18. Prelim. Resp. 69. After reviewing the record, we determine that Petitioner has demonstrated a reasonable likelihood of establishing that Zhu and Mao would have rendered claims 19–23, 25, 30–31, 34–36, 41–43, 45, and 49–51 obvious.

B. Ground 2: Asserted Obviousness over Szepesi and Mao

Petitioner asserts that claims 18, 19–23, 25, 30, 31, 35, 36, 41, 42, 45, and 48–51 would have been obvious over Szepesi and Mao. Pet. 2. The disputed issues for this ground are the same as for Ground 1. *Id.* at 9–41; Prelim. Resp. 25–65. In particular, Patent Owner argues that Petitioner's showing for Szepesi and Mao has the same deficiencies as Petitioner's showing for Zhu and Mao.[11] Prelim. Resp. 25–65. After reviewing the record, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing on Ground 2.

C. Ground 3: Asserted Obviousness over Matsumoto and Mao

Petitioner asserts that claims 18, 22, 23, 25, 30, 34, 41–43, 45, 48, 49, and 51 would have been obvious over Matsumoto and Mao. Pet. 2. The disputed issues for this ground are the same as for Ground 1. Pet. 9–27, 41–54; Prelim. Resp. 25–65. Specifically, Patent Owner argues that Petitioner's showing for Matsumoto and Mao has the same deficiencies as Petitioner's showing for Zhu and Mao. Prelim. Resp. 25–65. In addition, for Ground 3, Patent Owner argues that Petitioner improperly combines two distinct embodiments of Matsumoto. *Id.* at 65–69. Petitioner sets forth the combination of Matsumoto and Mao that it contends would have rendered the challenged claims obvious in its Annotated Combined Figure on page 47 of the Petition. Patent Owner argues that, in this combination, Petitioner improperly combined portions of Matsumoto's Figures 4 and 8, which,

[11] Patent Owner's makes one argument regarding Petitioner's constant-current rationale for Grounds 2 and 3 that it does not make for Ground 1. Prelim. Resp. 55–56 (arguing Szepesi and Matsumoto disclose the ability to run in a constant current mode). The parties should also address this argument at trial.

according to Patent Owner, are directed to entirely different types of converters. Prelim. Resp. 65–69.

In its Annotated Combined Figure, Petitioner combined portions of the circuits of Matsumoto Figures 4 and 8 with the bias circuit of Mao Figure 9. Pet. 46–47. Petitioner, however, provided no explanation for its combination of Figures 4 and 8 of Matsumoto. *Id.* Thus, on this record, it appears that Petitioner has not demonstrated a reasonable likelihood of proving that an ordinarily skilled artisan would have made the combination proposed by Petitioner and thus has not established a reasonable likelihood of prevailing on Ground 3.[12]

IV. DISCRETION UNDER 35 U.S.C. § 314 REGARDING THE FILING OF THREE PETITIONS CHALLENGING THE SAME PATENT

Petitioner filed three petitions challenging the patentability of the claims of the '713 patent. The first petition challenges claims 18–23, 25, 30, 31, 34–36, 41–43, 45, and 48–51 in this proceeding. The second petition challenges claims 24, 26–29, 32, 33, 38, 40, 44, 46, and 47 in IPR2021-00072 ("'072 IPR"). The third petition challenges claims 52–61 in IPR2021-00073 (""073 IPR"). Pursuant to the Board's Consolidated Trial Practice Guide, Petitioner filed a Notice Ranking and Explaining Material Differences Between Petitions for *Inter Partes* Review of U.S. Patent No. RE47,713. Paper 1 ("Notice"); PTAB Consolidated Trial Practice Guide, 59–60 (Nov. 2019) (available at https://www.uspto.gov/TrialPracticeGuideConsolidated). In its Notice, Petitioner requests that we institute in all three IPRs, but

[12] During trial, the parties may also want to address how, in Petitioner's combination of Matsumoto and Mao, the Vbias powers the control circuitry of Matsumoto. *See* Pet. 47.

consider the Petition in this proceeding first. Paper 1, 1. Patent Owner responded, requesting that we deny the petitions filed in the '072 and '073 IPRs. Paper 12, 1–5.

Because Petitioner ranked this Petition first and Patent Owner does not object, we decline to exercise our discretion to deny institution under 35 U.S.C. § 314(a) in this proceeding based on the filing of two additional petitions challenging the same patent. In separate decisions, we deny institution of the petitions in the '072 and '073 IPRs.

V. DISCRETION UNDER 35 U.S.C. § 325(D)

A. Advanced Bionics

Patent Owner asserts that we should exercise our discretion to deny institution of the *inter partes* review under 35 U.S.C. § 325(d). Prelim. Resp. 13–24; Prelim. Sur-reply 1–5. For the reasons that follow, we decline to deny institution on that basis.

In evaluating arguments under § 325(d), we use:

> [a] two-part framework: (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of [the] first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.

Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential); *see also Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017) (precedential as to Section III.C.5, first paragraph) (listing factors to consider in evaluating the applicability of § 325(d)) ("*Becton, Dickinson*").

Under *Advanced Bionics*, we consider factors (a), (b), and (d) of *Becton, Dickinson* in the evaluation of whether the same or substantially the same art or arguments were previously presented to the Office. *Advanced Bionics*, Paper 6 at 10. *Becton, Dickinson* identifies these factors as:

> (a) the similarities and material differences between the asserted art and the prior art involved during examination;
>
> (b) the cumulative nature of the asserted art and the prior art evaluated during examination; and
>
> (d) the extent of the overlap between the arguments made during examination and the manner in which petitioner relies on the prior art.

Becton, Dickinson, Paper 8 at 17–18. If the first part of the *Advanced Bionics* framework is satisfied, we turn to the second part, where we consider *Becton, Dickinson* factors (c), (e), and (f) in the evaluation of whether a petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. *Advanced Bionics*, Paper 6 at 10. *Becton, Dickinson* identifies these factors as:

> (c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection;
>
> (e) whether petitioner has pointed out sufficiently how the examiner erred in its evaluation of the asserted prior art; and
>
> (f) the extent to which additional evidence and facts presented in the petition warrant reconsideration of the prior art or arguments.

Becton, Dickinson, Paper 8 at 17–18.

B. Advanced Bionics Framework, First Part

As mentioned, the three grounds asserted by Petitioner involve the following four references: Zhu, Szepesi, Matsumoto, and Mao. Pet. 2. Zhu

and Szepesi were previously cited to the Office. Ex. 1001, code (56). Matsumoto and Mao were not. *Id.* Further, as set forth above, Mao is a reference for each asserted ground. Pet. 2.

For the first part of the *Advanced Bionics* framework (and factors (a), (b), and (d) of *Becton, Dickinson*), the parties dispute whether Mao is cumulative of references that were previously cited to the office. Prelim. Resp. 18–23; Prelim. Reply 1–3. The parties also dispute whether Matsumoto is cumulative to Zhu and Szepesi. Prelim. Resp. 16–18; Prelim. Reply 3–4. For this section 325(d) analysis, we, however, do not have to resolve this latter dispute because it only affects our analysis if Mao is cumulative to the previously cited references, and as set forth below, we determine that Mao is not.[13]

Patent Owner argues that Mao is cumulative of Usui and Brkovic, references that were considered by the Office. Prelim. Resp. 18–23. Patent Owner asserts that Petitioner's characterizations of Mao are similar to the Examiner's characterizations of Brkovic in a related patent application. *Id.* at 19–22. Patent Owner also argues that Usui discloses the same pertinent features as Mao. *Id.* at 22–23.

Petitioner disagrees, arguing that Mao is not cumulative of Usui and Brkovic because Mao teaches a bias circuit that (i) has a forward biased

[13] If Mao is not cumulative to the cited references, then the combination of references in each of the asserted grounds is not substantially the same as the art considered previously by the Office irrespective of whether Matsumoto is cumulative to Zhu and Szepesi. Each asserted ground relies on Mao and another reference (i.e., one of Zhu, Szepesi, and Matsumoto). Pet. 2. For each asserted ground, Petitioner relies on the combination of Mao and the other reference as teaching or suggesting limitations of independent claims 18 and 48. *Id.* at 19, 34–35, 48–50.

rectifier and (ii) is designed to be used with a secondary controller in an isolated power supply, whereas Usui and Brkovic do not. Prelim. Reply 1–2. Petitioner further argues that the Examiner's reasons for allowance indicate that Usui and Brkovic do not teach this feature. *Id.* at 2. Petitioner further asserts that neither Usui nor Brkovic is directed to a circuit for generating a bias supply voltage for a secondary-side control circuit. *Id.* at 3. Petitioner contends that instead Usui "relates to a resonant circuit with the purpose of maintaining optimum regulation over variations in the input voltage in a DC to DC power converter." *Id.* (citing Ex. 2009, code (54), 2:55–61, 4:25–36). Further, Petitioner argues Brkovic relates to a single-stage power correction circuit factor. *Id.*

Patent Owner responds, reiterating its contention that Mao is cumulative to Usui and Brkovic. Prelim. Sur-reply 1–4. Patent Owner argues that Petitioner does not rely on Mao for the features that purportedly distinguish Mao from Usui and Brkovic. *Id.* at 1–2. Patent Owner further asserts that Petitioner relies on Mao for "how [Mao's] bias voltage is generated and how Mao's bias circuits were alleged to meet the limitations of the specifically-claimed circuitry in the '713 patent." *Id.* at 2. Patent Owner provides, as an example, Petitioner's reliance on Mao for the recited first capacitor and first rectifier. *Id.* Patent Owner asserts that Usui also discloses these features. *Id.* Patent Owner further argues that, although Petitioner asserts that Mao diode 56 is poled to charge the capacitor during forward pulses of the power converter, Usui has analogous teachings. *Id.* at 2–3. Patent Owner further contends that the Examiner's reasons of allowance do not indicate that Mao is materially different from Usui and Brkovic. *Id.* at 3. Patent Owner further asserts that Mao's bias circuit is not on the secondary

side of its power converter and is not used to supply a voltage to any secondary-side circuit. *Id.*

We agree with Petitioner that Mao is materially different from, and noncumulative to, Usui and Brkovic. In particular, Mao teaches or suggests a circuit for generating a bias voltage for a secondary-side control circuit. Ex. 1006, 1:9–18. For example, Mao discloses circuitry for generating a bias voltage for use in the secondary stage of a flyback converter (and other converters). *Id.* at 1:9–16. Mao further discloses that this bias voltage may be used to power the control circuitry of the converter. *Id.* at 1:16–18. Patent Owner does not dispute that Usui and Brkovic do not teach a circuit for generating a bias voltage for a secondary-side control circuit. Prelim. Reply 3; Prelim. Sur-reply 4. Patent Owner also does not argue that Usui and Brkovic suggest such a circuit. Prelim. Sur-reply 4. Instead, Patent Owner argues that Mao's bias circuit is not on the secondary side of its power converter and is not used to supply a voltage to any secondary-side control circuit. *Id.* We disagree. As set forth in Section III.A.4.l., on this preliminary record, we find that the bias circuit in Mao Figure 9 is on the secondary side of its power converter. Further, as discussed immediately above, Mao teaches or suggests a circuit for generating a bias voltage for a secondary-side control circuit. Ex. 1006, 1:9–18.

This difference between Mao and the Usui and Brkovic references is material. The preambles and bodies of claims 18 and 48 recite a flyback converter. Ex. 1001, 14:1–43, 17:14–55. In each of Petitioner's proposed combinations of Mao with the primary references, Mao provides bias voltage to a controller in the secondary stage of the converter. Pet. 17, 32; 47. And Petitioner provides a reason (supported by evidence) why Mao's circuitry for

providing a bias voltage would advantageously power secondary side control circuitry (e.g., to accommodate low output voltages). *Id.* at 13–14, 29, 43. Neither party has asserted that Usui or Brkovic teaches or suggest providing a bias voltage to secondary control circuitry. Thus, Mao's teaching of generating a bias voltage for a secondary-side control circuit of a flyback converter constitutes a material difference between Mao and the Usui and Brkovic references.

Regarding the potential overlap between arguments made in this proceeding versus made previously to the Office, neither party has asserted that the Office previously considered any argument that accommodating low output voltages would have motivated an ordinarily skilled artisan to reach the claimed invention.

In sum, we determine that the asserted prior art and arguments are not substantially the same as those previously presented to the Office.

C. Advanced Bionics Framework, Second Part and Conclusion Regarding Discretion Under § 325(d)

Because the first part of the *Advanced Bionics* test is not satisfied, we need not proceed to the second part of the framework. *See Advanced Bionics* at 8 (second step of the framework only applies "if either condition of first part of the framework is satisfied").

In sum, we decline to exercise our discretion under 35 U.S.C. § 325(d) to deny institution of *inter partes* review.

VI. CONCLUSION

We are persuaded that Petitioner has demonstrated a reasonable likelihood of proving the unpatentability of at least one challenged claim of the '713 patent. We clarify, however, that our analysis is based only on the record as it stands now and that we have not made a final determination with

respect to the patentability of any challenged claim.[14] At trial, the parties should support any arguments they wish to make and should not rely on any preliminary findings or analysis in this Decision.

VII. ORDER

It is:

ORDERED that, pursuant to 35 U.S.C. § 314(a) an *inter partes* review of the '713 patent is hereby instituted on the asserted grounds set forth in the Petition; and

FURTHER ORDERED, that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is given of the institution of a trial, which commences on the entry date of this Decision.

[14] The Preliminary Response, the Preliminary Reply, and the Preliminary Sur-reply are not part of the trial record. If either party wishes to have an argument that it made in any of those papers considered for the Final Written Decision, that party must present that argument in the appropriate trial paper (e.g., Patent Owner Response, Petitioner's Reply).

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FOR PETITIONER:

Jennifer Huang
Kim Leung
FISH & RICHARDSON, P.C.
jjh@fr.com
leung@fr.com

FOR PATENT OWNER:

Jonathan Lindsay
CROWELL & MORRELL LLP
jlindsay@crowell.com

Hong Zhong
IRELL AND MANELLA LLP
hzhong@irell.com